



BAZOOKA DUCK WINS 2010 DARE TO BE DIGITAL CONTEST'S VISUAL ADRENALINE CHALLENGE AWARD

BY GARRET ROMAINE

SEVENTY-FIVE UNIVERSITY STUDENTS WORLDWIDE PARTICIPATE IN ELEVENTH ANNUAL STUDENT COMPETITION

WHAT DO YOU GET WHEN YOU BRING TOGETHER 75 GAME DEVELOPMENT CONTESTANTS IN 15 TEAMS ACROSS THREE CONTINENTS FOR 10 WEEKS? You get a terrific explosion of creative talent in one amazing competition. This year, a small duck with a big bazooka was voted as the best game by the competitors themselves and also won Intel's coveted Visual Adrenaline award. Thanks in part to Intel® tools and technology, students had the freedom to take their talents to the next level, and observers agreed that it was even more amazing than last year's phenomenal results.

Created by University of Abertay Dundee, Scotland in 1999, the annual Dare to be Digital contest targets university students interested in game development. Teams are formed with five undergraduates or recent graduates, who work together in a microcosm of a game-development company under a tight 10-week deadline to finish a functioning game prototype. Winners can expect recognition as well as job offers, depending on the quality of their finished product.

Dare to be Digital, at www.daretobedigital.com, has grown into an internationally renowned proving ground for talented computer science and art students to design their own original video game. Intel's involvement has always been strong because the company sees the importance of supporting the next generation of game software developers. Intel has been particularly interested in seeing what the students can do with the Intel® Graphics Performance Analyzers (Intel® GPA) to create games that display visual appeal and performance on Intel® HD Graphics platforms. Thus was born the Visual Adrenaline award, which goes to the team submitting the in-game sequence with the most visual appeal and best performance.

Judges measure visual appeal by considering a game's impact and by assessing the level of

emotion conveyed. A game does not necessarily need complexity or realism because the judges look at the images in a manner similar to determining winners in a photo contest. Performance, on the other hand, is

Team Bazooka Duck won the Intel Visual Adrenaline Award and the Team Choice Award at the 2010 Dare To Be Digital Contest.

about making intelligent use of the Intel® Core™ processor with Intel HD Graphics hardware. Contestants must render frames efficiently and make imaginative use of resources such as textures, shaders, and render-targets. Games are not judged on CPU performance, and multi-core operation is not required.

What follows is a recap of how the student teams used Intel tools to dig down to individual frames, and sometimes to a single pixel, to troubleshoot their code. The lesson here is simple: designing, building, and preparing a game for prime time, in 10 weeks, is hard enough without adding more layers. Yet that's what Intel added with the Visual Adrenaline Challenge: reward the team that best optimized their game to run on a mainstream configuration. With the help of the Intel GPA, teams were able to easily identify the bottlenecks in their game and address them. If students on a short 10-week development schedule can create a full-blown prototype from scratch using these tools, experienced developers should expect even better results.

Nine out of fifteen teams rose to that difficult challenge successfully, showing their games running at a playable frame rate, without sacrificing the look and feel, while often implementing non-trivial rendering techniques. All praised Intel GPA for its usefulness in this particular undertaking, but also in helping them tune their games across platforms.



Bazooka Duck Rewinds Time

The winner of the Visual Adrenaline Award for 2010 was Bazooka Duck's *Epoch Defence*. Judges agreed it was visually appealing and technically impressive, running at 20 frames per second at a resolution of 1600 x 1000 pixels. The game has a level of sophistication and polish that makes it look less like a student project and more like a real title.

The premise is clever, as well. Set in a kind of "War of the Worlds" scenario, gameplay resembles a standard real-time strategy (RTS) setup, with units of various abilities fending off an invasion of aliens who pack superior firepower. The intricacy of the game multiplies, however, when you run out of units. The game "rewinds" itself, so that you start a new round alongside your old units. As the creators explained, "This time, if you target the enemy strategically, you can save many of your fallen allies from their fate, bringing them back into your control, ready to continue their role in the war effort!"

Bazooka Duck kept a sporadic blog throughout the 10-week contest, capturing some of the frantic moments in building the game. Here's a snip from an early entry:

... Chris, Joe and I have been busy building the start of an RTS engine. Using Ogre for graphics, we've got units (currently ninjas, one of the more superior varieties of placeholder graphics) which we can click on and order to run around and attack each other.

The interface is being developed by Joe; yesterday I managed to add a button to play explosion sound effects, and Chris has been experimenting with physics engines... Meanwhile, the Dans (our artists) have been hard at work creating the models for our units, which we've successfully managed to import into the game as well.

Clearly, these are serious game developers in action. Bazooka Duck's Chris Thompson reported that Intel GPA was very helpful to the team. "It told us straightaway that our main problem was the fill rate of the graphics card. It told us where we needed to focus and what to try and cut. The [Intel] GPA tools also have a library for us in our own metrics, so we could benchmark the code as well as the graphics system. We used it to work out where bottlenecks were in our rendering system and find the model limits of the graphics cards on the Intel machine."

Mark Engley, one of the programmers on the Bears with Jetpacks team, helped produce *Grrr!* It's a basic action-strategy game, and thanks to the Intel GPA, Engley was able to optimize for various machines. "We got our game to run at something like almost 30 fps on the G45, but then when we took it back to our main machines, we found that essentially we had doubled the frame rate in that case as well. Obviously, if you're releasing a game you want it to be able to run on the widest range of computers possible. [Intel] GPA did a timeline of everything



(ABOVE) The premise behind *Epoch Defence* reminds players of an older version of "War of the Worlds," set in Victorian England.

(ABOVE, RIGHT) Bazooka Duck's *Epoch Defence* appears to be a standard real-time strategy title at first, but it actually operates in four dimensions. Each new round starts alongside the previous units.

(LOWER, RIGHT) Bazooka Duck put excellent detail into their terrain, structures, and units.





"Before and after" scene from *Grrri!*, produced by the team Bears with Jetpacks. The bottom screenshot contains much more detail, after optimization with Intel® Graphics Performance Analyzers.

we're drawing on the screen: trees, background, the football, the goalkeeper, and all that. When we looked at it we saw that our trees were taking maybe ten, twenty times longer to draw than the goalkeeper or the football. We were able to just cut the number of trees we're actually using in the game in half and place them where you would see them, as opposed to on the outskirts, cutting our draw time down by a huge amount."

Engley found that the main bottleneck was the way they were making a lot of very small draw calls. The team found that the game would speed up if they could group their draw calls together. "Our floor, for example, was a load of individual squares, and we were drawing each one of those squares as a separate draw call," Engley said. "The overhead was that each draw call takes a set amount of time, and then a bit of extra time for each, however complex the object is. But these objects were so simple that it was quicker to just group them all together and do them as one big draw call, so you just get the initial overhead of the draw call, and then drawing the extra triangles in the floor actually didn't take much time at all. Just that one change improved our frame rate by something like 30 percent."

Intel GPA also provided Engley a way to select an individual pixel and determine the actual history of that pixel in the draw call.

"Sometimes you might end up writing to a pixel more than once," Engley explained, "which is generally seen as being inefficient, and so if you know you're spending a lot of time overwriting the same pixels, you might choose to draw your object in a different way that causes these pixels to only get hit once."

The Bears with Jetpacks team found that if they could speed up their graphics code, they would solve the main bottleneck in their prototype. Engley said he was "amazed" at the level of detail the Intel GPA tool provided. "You can look at each draw call and look at the space that it's actually drawing to on-screen, and you can look at groups of draw calls and break it down to the individual pixel level. This was very good for optimizing our shaders, the things that actually draw the individual pixels on-screen. It was very useful for looking at the way that we were drawing our whole scene, so it gave a good range of information and quite high-level and low-level information as well."

Jocce Marklund, team leader for That Game Studio, helped produce *Twang*, a side-scrolling racing game. The team had a very positive experience with the Intel GPA tool. "We had a really rough shader, so it drained all our power from the computer and we wondered why," he recalled. "We used the [Intel] GPA to locate and fix the problems. The tool has really helped us a lot with just optimizing the game."

David Clarke, programmer on team eleMENTAL, was one of the creators of *Weatherman*, a 2.5D puzzle platformer, where the player solves puzzles using the weather and progresses through the game to find the missing pieces of his plane. Clarke and his team used Intel GPA to view performance statistics, such as how fast the game was running, how many draw calls they were making, and where the game was over-performing. "You could really see where you were doing things more efficiently," Clarke said, "and you could see where you might tune it and tweak it to make it run better."

An Iterative Process

Andrew Glass, programmer for team Shark on a Bike, said Intel GPA was crucial to their success. "The software lets you look at what's going on in the frame and helps you decide what you can change to make the frame go faster, so that your game will appear smoother and will actually be a bit more playable on certain machines. You look at another thing, do it again, then look at another thing, and this time maybe something else is bigger because the thing you made small was dominating the frame. When you get rid of that, you see a whole bunch of other things pop up, and it's kind of like an iterative process. Eventually, you get to the point where you don't need to change anything and it runs fast enough."

Daniel Leaver, programmer for *Silent Symphony*, was part of team Creative Genius. Their game consists of a character who

sees sound as color and uses a flute to make sounds that result in a cloud, which then interacts with the rest of the environment. Intel GPA helped them identify where the game was drawing clouds that weren't actually needed. "The Intel software enabled us to see that we were drawing the clouds unnecessarily, which was taking up time and the reason why the game was running slow. Once we corrected that we gained about 5 frames per second. We went from 25 FPS to 30 on a slow computer."

Team Gazhab created *Chayya*, a racing game in a black-and-white urban environment. The goal is to avoid red lights, which kill you, and look for green lights, which speed you up and get you back to your ship faster. According to Murray Speight, lead programmer, Intel GPA came in handy for getting down to individual frames. "It allows you to capture a frame of your game, maybe a bit which

you find [too] slow. So you can see exactly what has taken up all the resources of the processor [and] the graphics card. We've actually taken a couple of frames in different areas of the game and we've seen that some things were getting drawn more than others, and some things have got higher poly's in the game than they should really have."



Scene from *Dyed World*, produced by team Shark on a Bike.

The Big Finish: Dare ProtoPlay

The final part of the competition is Dare ProtoPlay, where awards are announced and all games are on display. In addition to the Visual Adrenaline Award, the three overall winning teams were announced: Angry Mango, Team Tickle, and That Game Studio. These teams were also the sole nominees for the British Academy of Film and Television Arts (BAFTA) Ones to Watch award, chosen by a panel of gaming industry experts during the three-day event.

Clearly, the young students have come a long way in 10 weeks, networking like crazy, learning new tricks, and adopting new tools. The contestants have their prototypes, but things won't end there. Every participant will have great resume fodder and a crown jewel for their portfolio. Imagine how valuable it is to be able to talk about your first-hand experience with all phases of game development when being interviewed for your first job. That confidence with leading tools and advanced processors is part of what makes it all worthwhile for Intel, and what makes the future of gaming look so bright. ■

ABOUT THE AUTHOR

Garret Romaine is a senior writer, working for Rose & Her Minions from Beaverton, Oregon. Garret started in gaming as a beta tester for Epic MegaGames and has been a columnist, editor, and reviewer ever since. Garret is a Fellow in the Society for Technical Communication and teaches technical writing at Portland State University.

Teams That Participated in the 2010 Dare to Be Digital Contest

TEAM	GAME	PREMISE
Abnormal Creations	<i>The Inkwell Chronicles</i>	2.5D puzzle/adventure PC game
Angry Mango	<i>Mush</i>	Microsoft Windows* 7 phone 2D platform puzzler
Bazooka Duck	<i>Epoch Defence</i>	Time-based tactics game
Bears with Jetpacks	<i>Grrr!</i>	Multi-player real-time strategy for Wii*
Creative Genius	<i>Silent Symphony</i>	2.5D puzzle game
eleMENTAL	<i>Weatherman</i>	3D platformer PC game
Gazhab	<i>Chayya</i>	Third-person stealth platformer
Grimnir Games	<i>Death Inc.</i>	2.5D side-scrolling platformer
King of Dice	<i>Dice Rolling</i>	3D puzzle game
Nevermind Games	<i>WiiKick</i>	Multiplayer football party
Ramblin' Wreckage	<i>Hella Umbrella</i>	Android* phone puzzler
Shark on a Bike	<i>Dyed World</i>	2.5D adventure/puzzle
Team Tickle	<i>Sculpty</i>	Physics-based platform for Apple iPad*
That Game Studio	<i>Twang</i>	Side-scrolling racing game
Various Artists	<i>Legendary Crusaders</i>	Puzzle



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